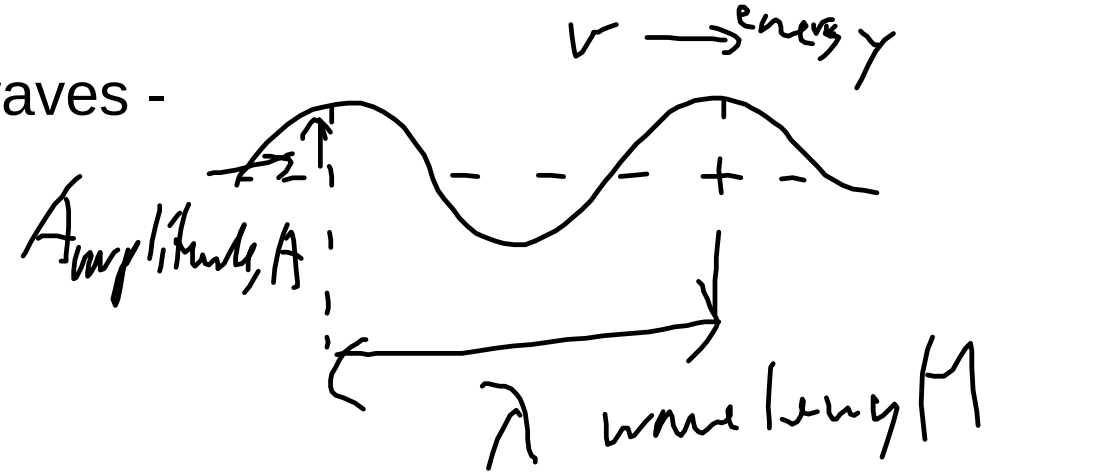
Test Review:

Monday - Chapters 14, 15, 16, 17

Ch 14 - Waves

waves - energy transfer due to oscillations in a medium.

transvers waves -

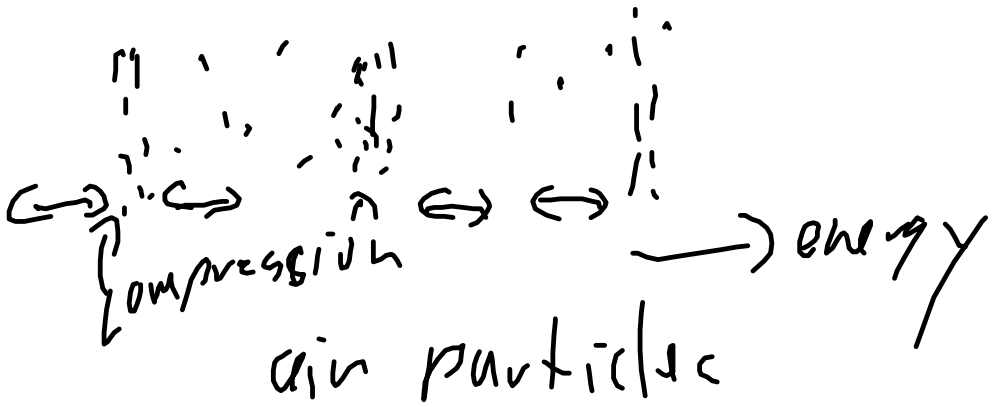


Period, T = time between waves

$T = \frac{1}{f}$ f is frequency, in Hz

= # waves / s

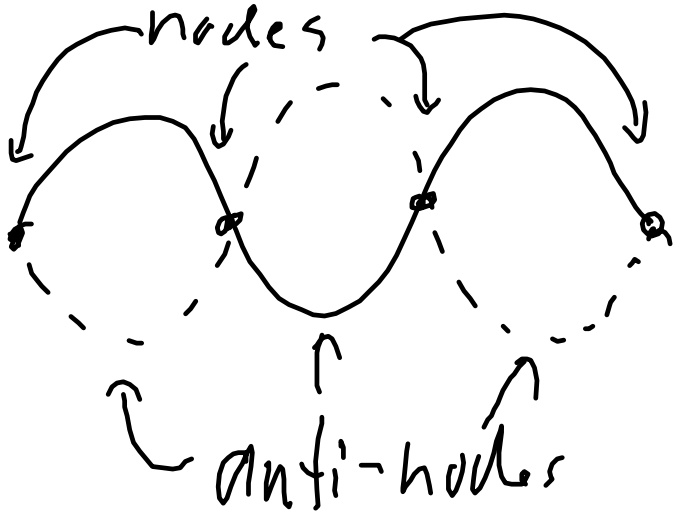
Longitudinal - medium oscillates in the direction of energy transfer. eg. sound or compression in spring



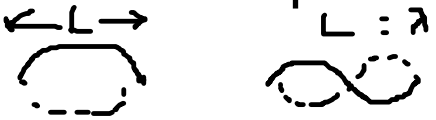
surface waves - both longitudinal and transverse

when waves meet they interfere
- constructive amplitudes add
- destructive amplitudes cancel

standing waves are produced when two sets of waves interfere to produce high amplitude waves that don't seem to move.



Chapter 15 - Sound
In strings or open tubes, resonance happens when the length, L = Nλ/2 N is a whole number
or L= Nv/2f L=λ/2 next frequency is L=λ
because v=λf



For closed tube, L=(2N-1)λ/4 = (2N-1)v/4f

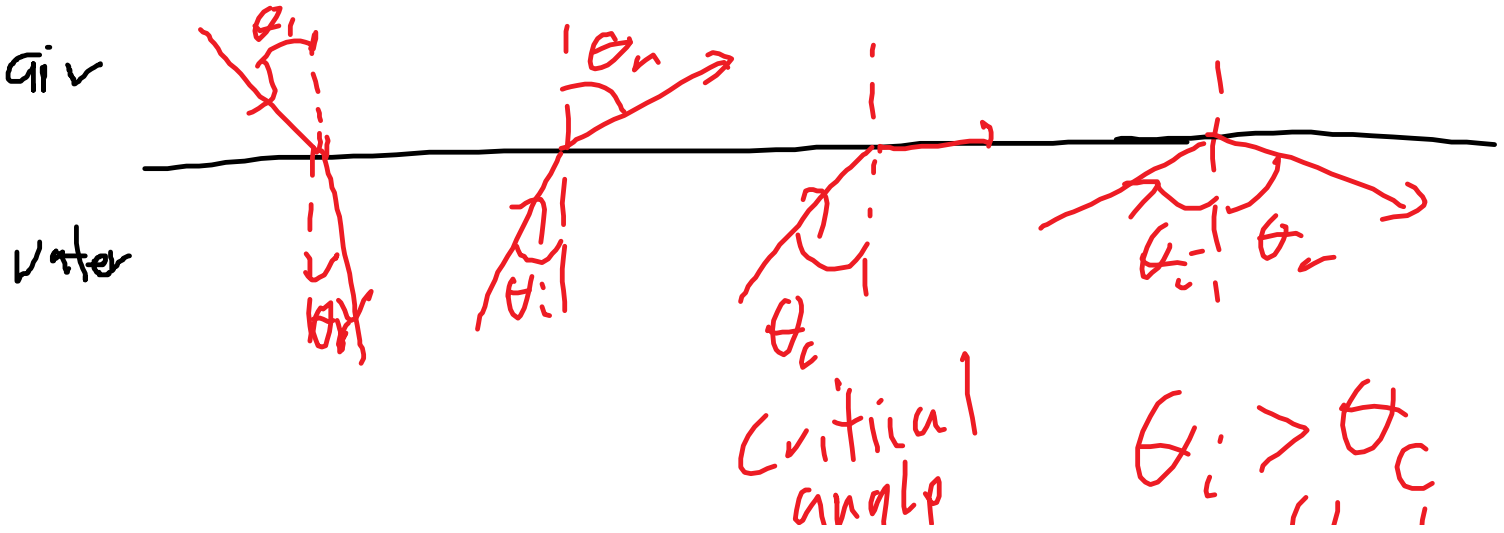
Doppler effect - neeeeeeyowwwww
source of waves and observer are moving towards each other, frequency is higher, - if they move apart, frequency is lower

beats - if two sources are out of tune, you hear beats: "wah wah" sound. frequency of the beats = difference in the frequencies
$f_b = |f_2 - f_1|$

Ch 16
electromagnetic
moves at $c=3.00 \times 10^8 m/s$ in a vacuum
radio, micro, infrared, visible, ultraviolet, x-rays, gamma rays

Ch17
Focus
reflection and refraction
law of reflection: angle of incidence = angle of reflection

Snell's Law
$n_i \sin\theta_i = n_r \sin\theta_r$ where n = c/v



$\theta_r = 90°$ reflection

$n_i > n_r$

p364 Q4,13,14,21,23,25 27

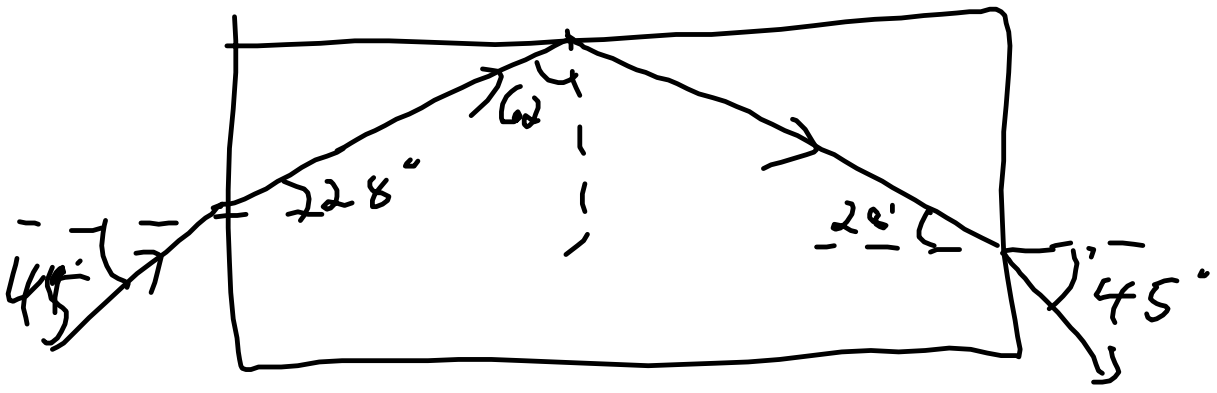
p326 Q17, 18a, 18b, 20,
25 bonus $f' = f\,(v+v_o)/(v-v_s)$

Q21 – $\sin\theta_c = \frac{n_r}{n_i}$

$n_i = \frac{n}{\sin\theta_c} = \frac{1}{\sin 45°}$

$n_i = \sqrt{2} = 1.41$

$n = 1.52$



$n_i \sin\theta_i = n_r \sin\theta_r$

$1.000 \sin 45^\circ = 1.52 \sin\theta_r$

$\theta_r = 26^\circ$

$1.52 \sin 62^\circ = 1.000 \sin\theta_r$ over

$\theta_r =$ error → critical

Q25

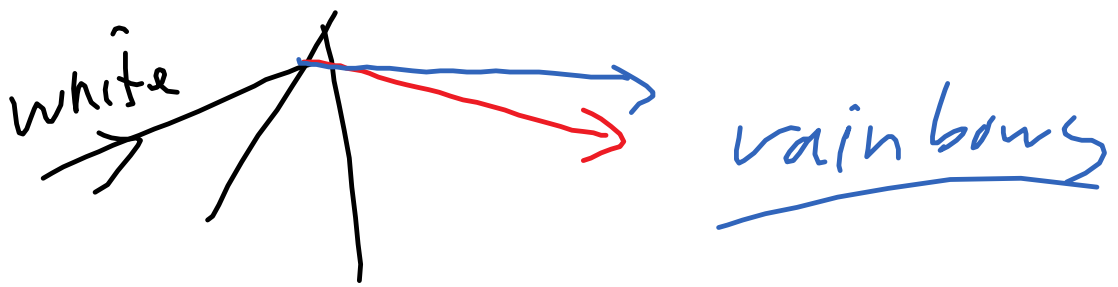
red light $n_i \sin\theta_i = n_r \sin\theta_r$

$1.0003 \sin 30.0^\circ = 2.410 \sin\theta_r$

$\theta_r = 12.0^\circ$

blue light

$\theta_r = 11.8^\circ$

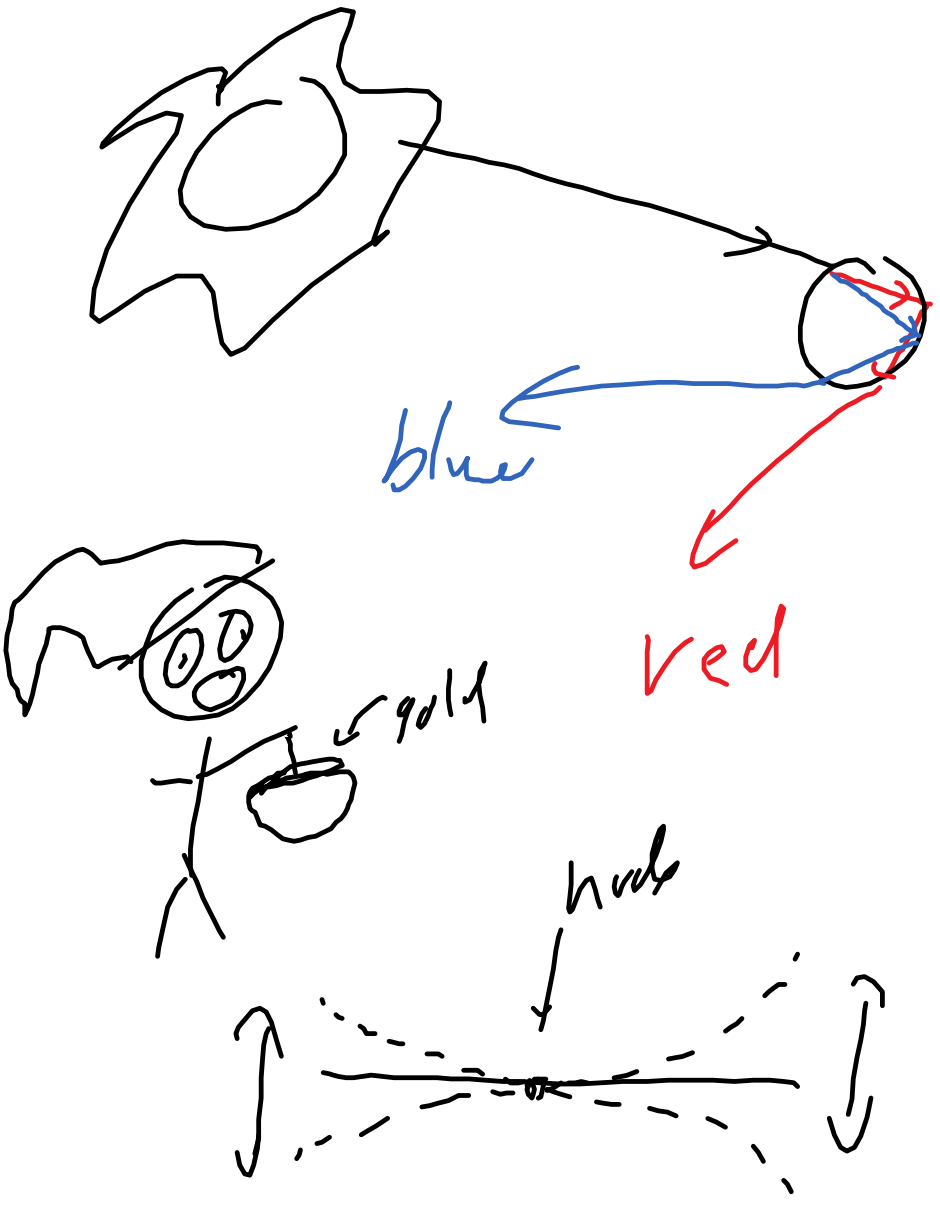


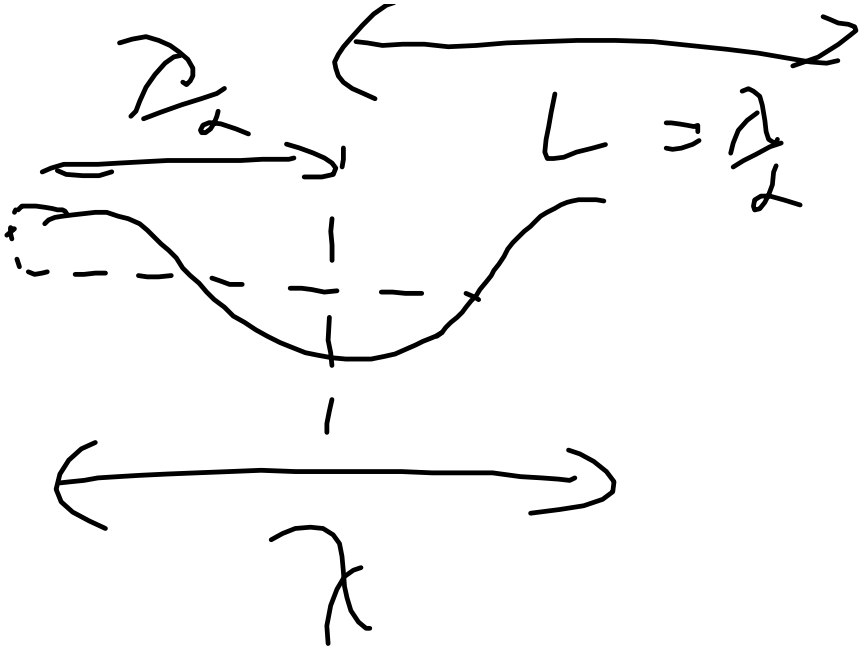
27 $n = c$

$$V = \frac{C}{n} = \frac{3.00 \times 10^8 \text{ m/s}}{1.53}$$

$$V_{blue} = 1.96 \times 10^8 \text{ m/s}$$

b) $V_{red} = 1.98 \times 10^8 \text{ m/s}$





$\lambda = 2L = 2.0\,m$

$f = \frac{V}{\lambda} = \frac{5150\,m/s}{2\,m}$

$f = 2575\,Hz$

$f = 2.6\,kHz$

(6a) $\lambda = \frac{V}{f} = \frac{343\,m/s}{16.4\,Hz}$

$\lambda = 20.9\,m$

$L = \frac{\lambda}{2}$ open

$L = \frac{20.9}{2} = 10.45\,m$

$10.5\,m$

b) $L = 10.452\,m = \frac{\lambda}{4}$

$$f = ? = \frac{v}{\lambda} = \frac{343 m/s}{4(10.65)}$$

$$\boxed{f = 8.2 Hz}$$

Q20 $f_b = |f_2 - f_1|$

$3.0 Hz = |445 - f_1|$

$f_1 = 445 \pm 3.0 Hz$

$= \boxed{448 Hz \text{ or } 442 Hz}$

Q25 Bonus

$$f' = f \frac{(v + v_o)}{(v - v_s)}$$

$$443 = 440 \frac{(343 - 0)}{(343 - v)}$$

$v = 2.32 m/s$